SEQUENCE LISTING

(1) GENERAL INFORMATION:

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    (ii) TITLE OF INVENTION: NEW GROWTH/DIFFERENTIATION FACTORS OF THE TGF-β FAMILY

    (iii) NUMBER OF SEQUENCES: 49

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    (v) COMPUTER READABLE FORM:
        (A) MEDIUM TYPE: Floppy disk
        (B) COMPUTER: IBM PC compatible
        (C) OPERATING SYSTEM: PC-DOS/MS-DOS
        (D) SOFTWARE: PatentIn Release #1.0, Version #1.30

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        (B) FILING DATE: 12-JUL-1996
        (C) CLASSIFICATION:

    (vii) PRIOR APPLICATION DATA:
        (A) APPLICATION NUMBER: PCT/EP96/03065
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    (vii) PRIOR APPLICATION DATA:
        (A) APPLICATION NUMBER: PCT/EP93/00350
        (B) FILING DATE: 12-FEB-1993

    (vii) PRIOR APPLICATION DATA:
        (A) APPLICATION NUMBER: US 08/482,577
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    (vii) PRIOR APPLICATION DATA:
        (A) APPLICATION NUMBER: EP 92 102 324.8

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      (vii) PRIOR APPLICATION DATA:
            (A) APPLICATION NUMBER: DE P 44 23 190.3
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      (vii) PRIOR APPLICATION DATA:
            (A) APPLICATION NUMBER: DE 195 11 243.1
            (B) FILING DATE: 27-MAR-1995

     (viii) ATTORNEY/AGENT INFORMATION:
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            (B) REGISTRATION NUMBER: 36,105
            (C) REFERENCE/DOCKET NUMBER: P564-6010

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(2) INFORMATION FOR SEQ ID NO:1:
     (i) SEQUENCE CHARACTERISTICS:
     (A) LENGTH: 2272 base pairs
     (B) TYPE: nucleic acid
     (C) STRANDEDNESS: single
     (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

CAAGGAGCCA TGCCAGCTGG ACACACACTT CTTCCAGGGC CTCTGGCAGC CAGGACAGAG   60

TTGAGACCAC AGCTGTTGAG ACCCTGAGCC CTGAGTCTGT ATTGCTCAAG AAGGGCCTTC   120

CCCAGCAATG ACCTCCTCAT TGCTTCTGGC CTTTCTCCTC CTGGCTCCAA CCACAGTGGC   180

CACTCCCAGA GCTGGCGGTC AGTGTCCAGC ATGTGGGGGG CCCACCTTGG AACTGGAGAG   240

CCAGCGGGAG CTGCTTCTTG ATCTGGCCAA GAGAAGCATC TTGGACAAGC TGCACCTCAC   300

CCAGCGCCCA ACACTGAACC GCCCTGTGTC CAGAGCTGCT TTGAGGACTG CACTGCAGCA   360

CCTCCACGGG GTCCCACAGG GGGCACTTCT AGAGGACAAC AGGGAACAGG AATGTGAAAT   420

CATCAGCTTT GCTGAGACAG GCCTCTCCAC CATCAACCAG ACTCGTCTTG ATTTTCACTT   480

                                40

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CTCCTCTGAT AGAACTGCTG GTGACAGGGA GGTCCAGCAG GCCAGTCTCA TGTTCTTTGT      540

GCAGCTCCCT TCCAATACCA CTTGGACCTT GAAAGTGAGA GTCCTTGTGC TGGGTCCACA      600

TAATACCAAC CTCACCTTGG CTACTCAGTA CCTGCTGGAG GTGGATGCCA GTGGCTGGCA      660

TCAACTCCCC CTAGGGCCTG AAGCTCAAGC TGCCTGCAGC CAGGGGCACC TGACCCTGGA      720

GCTGGTACTT GAAGGCCAGG TAGCCCAGAG CTCAGTCATC CTGGGTGGAG CTGCCCATAG .     780

GCCTTTTGTG GCAGCCCGGG TGAGAGTTGG GGGCAAACAC CAGATTCACC GACGAGGCAT      840

CGACTGCCAA GGAGGGTCCA GGATGTGCTG TCGACAAGAG TTTTTTGTGG ACTTCCGTGA      900

GATTGGCTGG CACGACTGGA TCATCCAGCC TGAGGGCTAC GCCATGAACT TCTGCATAGG      960

GCAGTGCCCA CTACACATAG CAGGCATGCC TGGTATTGCT GCCTCCTTTC ACACTGCAGT     1020

GCTCAATCTT CTCAAGGCCA ACACAGCTGC AGGCACCACT GGAGGGGGCT CATGCTGTGT     1080

ACCCACGGCC CGGCGCCCCC TGTCTCTGCT CTATTATGAC AGGGACAGCA ACATTGTCAA     1140 .

GACTGACATA CCTGACATGG TAGTAGAGGC CTGTGGGTGC AGTTAGTCTA TGTGTGGTAT     1200

GGGCAGCCCA AGGTTGCATG GGAAAACACG CCCCTACAGA AGTGCACTTC CTTGAGAGGA     1260

GGGAATGACC TCATTCTCTG TCCAGAATGT GGACTCCCTC TTCCTGAGCA TCTTATGGAA     1320

ATTACCCCAC CTTTGACTTG AAGAAACCTT CATCTAAAGC AAGTCACTGT GCCATCTTCC     1380

TGACCACTAC CCTCTTTCCT AGGGCATAGT CCATCCCGCT AGTCCATCCC GCTAGCCCCA     1440

CTCCAGGGAC TCAGACCCAT CTCCAACCAT GAGCAATGCC ATCTGGTTCC CAGGCAAAGA     1500

CACCCTTAGC TCACCTTTAA TAGACCCCAT AACCCACTAT GCCTTCCTGT CCTTTCTACT     1560

CAATGGTCCC CACTCCAAGA TGAGTTGACA CAACCCCTTC CCCCAATTTT TGTGGATCTC     1620

CAGAGAGGCC CTTCTTTGGA TTCACCAAAG TTTAGATCAC TGCTGCCCAA AATAGAGGCT     1680

TACCTACCCC CCTCTTTGTT GTGAGCCCCT GTCCTTCTTA GTTGTCCAGG TGAACTACTA     1740

AAGCTCTCTT TGCATACCTT CATCCATTTT TTGTCCTTCT CTGCCTTTCT CTATGCCCTT     1800

AAGGGGTGAC TTGCCTGAGC TCTATCACCT GAGCTCCCCT GCCCTCTGGC TTCCTGCTGA     1860

GGTCAGGGCA TTTCTTATCC CTGTTCCCTC TCTGTCTAGG TGTCATGGTT CTGTGTAACT     1920

GTGGCTATTC TGTGTCCCTA CACTACCTGG CTACCCCCTT CCATGGCCCC AGCTCTGCCT     1980
```

41

ACATTCTGAT TTTTTTTTTT TTTTTTTTTT TGAAAAGTTA AAAATTCCTT AATTTTTTAT   2040

TCCTGGTACC ACTACCACAA TTTACAGGGC AATATACCTG ATGTAATGAA AAGAAAAAGA   2100

AAAAGACAAA GCTACAACAG ATAAAAGACC TCAGGAATGT ACATCTAATT GACACTACAT   2160

TGCATTAATC AATAGCTGCA CTTTTTGCAA ACTGTGGCTA TGACAGTCCT GAACAAGAAG   2220

GGTTTCCTGT TTAAGCTGCA GTAACTTTTC TGACTATGGA TCATCGTTCC TT   2272

    (2) INFORMATION FOR SEQ ID NO:2:

       (i) SEQUENCE CHARACTERISTICS:
          (A) LENGTH: 352 amino acids
          (B) TYPE: amino acid
          (C) STRANDEDNESS: single
          (D) TOPOLOGY: linear

      (ii) MOLECULE TYPE: peptide

      (xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Met Thr Ser Ser Leu Leu Leu Ala Phe Leu Leu Leu Ala Pro Thr Thr
1   5   10   15

Val Ala Thr Pro Arg Ala Gly Gly Gln Cys Pro Ala Cys Gly Gly Pro
            20   25   30

Thr Leu Glu Leu Glu Ser Gln Arg Glu Leu Leu Leu Asp Leu Ala Lys
        35   40   45

Arg Ser Ile Leu Asp Lys Leu His Leu Thr Gln Arg Pro Thr Leu Asn
        50   55   60

Arg Pro Val Ser Arg Ala Ala Leu Arg Thr Ala Leu Gln His Leu His
65   70   75   80

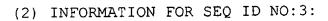Gly Val Pro Gln Gly Ala Leu Leu Glu Asp Asn Arg Glu Gln Glu Cys
                85   90   95

Glu Ile Ile Ser Phe Ala Glu Thr Gly Leu Ser Thr Ile Asn Gln Thr
                100   105   110

Arg Leu Asp Phe His Phe Ser Ser Asp Arg Thr Ala Gly Asp Arg Glu
            115   120   125

Val Gln Gln Ala Ser Leu Met Phe Phe Val Gln Leu Pro Ser Asn Thr
            130   135   140

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Thr Trp Thr Leu Lys Val Arg Val Leu Val Leu Gly Pro His Asn Thr
145   150   155   160

Asn Leu Thr Leu Ala Thr Gln Tyr Leu Leu Glu Val Asp Ala Ser Gly
            165   170   175

Trp His Gln Leu Pro Leu Gly Pro Glu Ala Gln Ala Ala Cys Ser Gln
            180   185   190

Gly His Leu Thr Leu Glu Leu Val Leu Glu Gly Gln Val Ala Gln Ser
            195   200   205

Ser Val Ile Leu Gly Gly Ala Ala His Arg Pro Phe Val Ala Ala Arg
    210   215   220

Val Arg Val Gly Gly Lys His Gln Ile His Arg Arg Gly Ile Asp Cys
225   230   235   240

Gln Gly Gly Ser Arg Met Cys Cys Arg Gln Glu Phe Phe Val Asp Phe
            245   250   255

Arg Glu Ile Gly Trp His Asp Trp Ile Ile Gln Pro Glu Gly Tyr Ala
            260   265   270

Met Asn Phe Cys Ile Gly Gln Cys Pro Leu His Ile Ala Gly Met Pro
            275   280   285

Gly Ile Ala Ala Ser Phe His Thr Ala Val Leu Asn Leu Leu Lys Ala
    290   295   300

Asn Thr Ala Ala Gly Thr Thr Gly Gly Gly Ser Cys Cys Val Pro Thr
305   310   315   320

Ala Arg Arg Pro Leu Ser Leu Leu Tyr Tyr Asp Arg Asp Ser Asn Ile
            325   330   335

Val Lys Thr Asp Ile Pro Asp Met Val Val Glu Ala Cys Gly Cys Ser
            340   345   350

(2) INFORMATION FOR SEQ ID NO:3:

(i) SEQUENCE CHARACTERISTICS:
  (A) LENGTH: 1558 base pairs
  (B) TYPE: nucleic acid
  (C) STRANDEDNESS: single
  (D) TOPOLOGY: linear

43

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

```
AAGGAGTCAT GCCAGTCGGA GGTCAGTCAC ATTCCTCCCA GGGTCCCTGG TGCCCAGGAC   60
AGAGTTGAAG CACTCCCGTT GAGACCCTGA ATATAGGCTT TGGGTCCTTT AAGGAGGCTA  120
TCCTCCAGCA ATGGCCTCCT CCTTGCTCCT GGCTCTTCTG TTCCTGACTC CAACCACAGT  180
AGTGAACCCC AAAACTGAGG GTCCATGCCC AGCATGTTGG GGTGCCATCT TTGACCTGGA  240
GAGCCAGCGG GAGCTGCTTC TCGATTTGGC CAAGAAAAGT ATCCTGGACA AGCTGCACCT  300
CAGCCAGCGC CCCATACTCA GTCGGCCAGT GTCCAGAGGG GCTCTCAAGA CCGCGCTGCA  360
GCGCCTCCGC GGGCCTCGAC GGGAAACCCT GTTGGAGCAT GACCAGAGAC AAGAAGAATA  420
TGAGATCATC AGCTTTGCTG ACACAGACCT CTCCAGCATC AACCAGACCC GGCTCGAGTT  480
CCACTTCTCT GGTAGAATGG CCAGTGGCAT GGAGGTCCGG CAGACCCGCT TCATGTTCTT  540
CGTGCAGTTC CCCCACAATG CCACCCAGAC CATGAATATA AGAGTTCTTG TGCTAAGACC  600
ATATGACACC AACCTCACCT TGACAAGTCA GTACGTGGTG CAGGTGAATG CCAGTGGCTG  660
GTACCAGCTT CTCCTGGGAC CTGAAGCTCA AGCTGCTTGC AGCCAGGGAC ACCTTACTCT  720
GGAGCTGGTA CCAGAAAGCC AGGTGGCCCA CAGTTCCTTG ATCCTGGGCT GGTTTTCCCA  780
CAGGCCTTTT GTGGCAGCCC AGGTAAGGGT TGAGGGCAAG CATCGGGTTC GCCGGCGAGG  840
TATCGATTGC CAGGGGGGGT CCAGGATGTG CTGTCGACAA GAGTTTTTTG TAGACTTCCG  900
TGAGATTGGC TGGAATGACT GGATCATCCA GCCTGAAGGC TATGCCATGA ACTTCTGCAC  960
TGGGCAGTGC CCACTACATG TGGCAGGCAT GCCTGGCATC TCTGCCTCCT TCACACTGC  1020
AGTGCTGAAT CTGCTCAAAG CCAACGCAGC TGCTGGCACC ACTGGCAGGG GCTCGTGCTG  1080
CGTGCCTACA TCTCGGCGCC CTCTGTCTTT GCTCTACTAT GACAGGGACA GCAACATTGT  1140
CAAGACGGAT ATACCTGACA TGGTGGTCGA GGCCTGCGGG TGTAGTTAGC TTATGGGTGA  1200
TACAGGCTGC CTGAGGTAGA ATGGCCTTCC TCAGGAAGGG AAACTCTGTT CCCACTTCTG  1260
TCCAGAATGG AAACACCTTT CTAAGCATGC AGACATCCCT CTGTGGACTT CAGGGGATCC  1320
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44

ACCTCTAAAG AGAGTCACTA GTGACCAACA GCCTTTCTCT CTCCTGGGAC ATGGTTGACC 1380

CAGTACACCC ATCCTCAGCC TTAAGTTAGA GGCTAATCGA CTCCTACATA TATATGTCAT 1440

TTTGTCCTAG CAAACACCCC TTAGCTCCCC TTAGTCAACT ATGTAATCTA CTCTGCCTCC 1500

CTGACCCTGC CACCGGAAGG TTCCTATTCC ACGATGATAT GCCTTAGTGT CTCCCCTT 1558

(2) INFORMATION FOR SEQ ID NO:4:

(i) SEQUENCE CHARACTERISTICS:
  (A) LENGTH: 352 amino acids
  (B) TYPE: amino acid
  (C) STRANDEDNESS: single
  (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

Met Ala Ser Ser Leu Leu Leu Ala Leu Leu Phe Leu Thr Pro Thr Thr
1   5   10   15

Val Val Asn Pro Lys Thr Glu Gly Pro Cys Pro Ala Cys Trp Gly Ala
            20   25   30

Ile Phe Asp Leu Glu Ser Gln Arg Glu Leu Leu Leu Asp Leu Ala Lys
        35   40   45

Lys Ser Ile Leu Asp Lys Leu His Leu Ser Gln Arg Pro Ile Leu Ser
    50   55   60

Arg Pro Val Ser Arg Gly Ala Leu Lys Thr Ala Leu Gln Arg Leu Arg
65   70   75   80

Gly Pro Arg Arg Glu Thr Leu Leu Glu His Asp Gln Arg Gln Glu Glu
            85   90   95

Tyr Glu Ile Ile Ser Phe Ala Asp Thr Asp Leu Ser Ser Ile Asn Gln
            100   105   110

Thr Arg Leu Glu Phe His Phe Ser Gly Arg Met Ala Ser Gly Met Glu
        115   120   125

Val Arg Gln Thr Arg Phe Met Phe Phe Val Gln Phe Pro His Asn Ala

45

130   135   140

Thr Gln Thr Met Asn Ile Arg Val Leu Val Leu Arg Pro Tyr Asp Thr
145   150   155   160

Asn Leu Thr Leu Thr Ser Gln Tyr Val Val Gln Val Asn Ala Ser Gly
                        165   170   175

Trp Tyr Gln Leu Leu Leu Gly Pro Glu Ala Gln Ala Ala Cys Ser Gln
                        180   185   190

Gly His Leu Thr Leu Glu Leu Val Pro Glu Ser Gln Val Ala His Ser
                        195   200   205

Ser Leu Ile Leu Gly Trp Phe Ser His Arg Pro Phe Val Ala Ala Gln
        210   215   220

Val Arg Val Glu Gly Lys His Arg Val Arg Arg Gly Ile Asp Cys
225   230   235   240

Gln Gly Gly Ser Arg Met Cys Cys Arg Gln Glu Phe Phe Val Asp Phe
                        245   250   255

Arg Glu Ile Gly Trp Asn Asp Trp Ile Ile Gln Pro Glu Gly Tyr Ala
                        260   265   270

Met Asn Phe Cys Thr Gly Gln Cys Pro Leu His Val Ala Gly Met Pro
                        275   280   285

Gly Ile Ser Ala Ser Phe His Thr Ala Val Leu Asn Leu Leu Lys Ala
        290   295   300

Asn Ala Ala Ala Gly Thr Thr Gly Arg Gly Ser Cys Cys Val Pro Thr
305   310   315   320

Ser Arg Arg Pro Leu Ser Leu Leu Tyr Tyr Asp Arg Asp Ser Asn Ile
                        325   330   335

Val Lys Thr Asp Ile Pro Asp Met Val Val Glu Ala Cys Gly Cys Ser
                        340   345   350

    (2) INFORMATION FOR SEQ ID NO:5:

    (i) SEQUENCE CHARACTERISTICS:
     (A) LENGTH: 18 base pairs
     (B) TYPE: nucleic acid
     (C) STRANDEDNESS: single
     (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

CAGGTAGGTC CATGGTCG   18

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 18 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

CTTGATTTTT AACAGACC   18

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 106 amino acids
(B) TYPE: amino acid
(C) STRANDEDNESS:
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

Cys Cys Arg Gln Glu Phe Phe Val Asp Phe Arg Glu Ile Gly Trp His
1   5   10   15

Asp Trp Ile Ile Gln Pro Glu Gly Tyr Ala Met Asn Phe Cys Ile Gly
            20   25   30

Gln Cys Pro Leu His Ile Ala Gly Met Pro Gly Ile Ala Ala Ser Phe
        35   40   45

His Thr Ala Val Leu Asn Leu Leu Lys Ala Asn Thr Ala Ala Gly Thr

47

Thr Gly Gly Gly Ser Cys Cys Val Pro Thr Ala Arg Arg Pro Leu Ser
65   70   75   80

Leu Leu Tyr Tyr Asp Arg Asp Ser Asn Ile Val Lys Thr Asp Ile Pro
                85   90   95

Asp Met Val Val Glu Ala Cys Gly Cys Ser
            100   105

(2) INFORMATION FOR SEQ ID NO:8:

    (i) SEQUENCE CHARACTERISTICS:
         (A) LENGTH: 106 amino acids
         (B) TYPE: amino acid
         (C) STRANDEDNESS:
         (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: protein

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

Cys Cys Lys Lys Gln Phe Phe Val Ser Phe Lys Asp Ile Gly Trp Asn
1   5   10   15

Asp Trp Ile Ile Ala Pro Ser Gly Tyr His Ala Asn Tyr Cys Glu Gly
            20   25.   30

Glu Cys Pro Ser His Ile Ala Gly Thr Ser Gly Ser Ser Leu Ser Phe
            35   40   45

His Ser Thr Val Ile Asn His Tyr Arg Met Arg Gly His Ser Pro Phe
    50   55   60

Ala Asn Leu Lys Ser Cys Cys Val Pro Thr Lys Leu Arg Pro Met Ser
65   70   75   80

Met Leu Tyr Tyr Asp Asp Gly Gln Asn Ile Ile Lys Lys Asp Ile Gln
                85   90   95

Asn Met Ile Val Glu Glu Cys Gly Cys Ser
            100   105

(2) INFORMATION FOR SEQ ID NO:9:

    (i) SEQUENCE CHARACTERISTICS:

48

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            (A)  LENGTH: 105 amino acids
            (B)  TYPE: amino acid
            (C)  STRANDEDNESS:
            (D)  TOPOLOGY: linear

    (ii)  MOLECULE TYPE: protein



    (xi)  SEQUENCE DESCRIPTION: SEQ ID NO:9:

    Cys Cys Arg Gln Gln Phe Phe Ile Asp Phe Arg Leu Ile Gly Trp Asn
    1               5               10              15

    Asp Trp Ile Ile Ala Pro Thr Gly Tyr Tyr Gly Asn Tyr Cys Glu Gly
                20              25              30

    Ser Cys Pro Ala Tyr Leu Ala Gly Val Pro Gly Ser Ala Ser Ser Phe
                35              40              45

    His Thr Ala Val Val Asn Gln Tyr Arg Met Arg Gly Leu Asn Pro Gly
        50              55              60

    Thr Val Asn Ser Cys Cys Ile Pro Thr Lys Leu Ser Thr Met Ser Met
    65              70              75                      80

    Leu Tyr Phe Asp Asp Glu Tyr Asn Ile Val Lys Arg Asp Val Pro Asn
                85              90                      95

    Met Ile Val Glu Glu Cys Gly Cys Ala
                100             105
```

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    (xi)  SEQUENCE DESCRIPTION: SEQ ID NO:10:

    Cys His Arg Val Ala Leu Asn Ile Ser Phe Gln Glu Leu Gly Trp Glu
    1               5               10              15
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Arg Trp Ile Val Tyr Pro Pro Ser Phe Ile Phe His Tyr Cys His Gly
              20                  25              30

Gly Cys Gly Leu His Ile Pro Pro Asn Leu Ser Leu Pro Val Pro Gly
          35              40                  45

Ala Pro Pro Thr Pro Ala Gln Pro Tyr Ser Leu Leu Pro Gly Ala Gln
    50                  55              60

Pro Cys Cys Ala Ala Leu Pro Gly Thr Met Arg Pro Leu His Val Arg
65              70                  75                      80

Thr Thr Ser Asp Gly Gly Tyr Ser Phe Lys Tyr Glu Thr Val Pro Asn
                85                  90                  95

Leu Leu Thr Gln His Cys Ala Cys Ile
                100             105
```

(2) INFORMATION FOR SEQ ID NO:11:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 36 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

ATGAATTCCC ATGGACCTGG GCTGGMAKGA MTGGAT   36

(2) INFORMATION FOR SEQ ID NO:12:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

ACGTGGGGTG GAATGACTGG AT

(2) INFORMATION FOR SEQ ID NO:13:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

ATATTGGCTG GAGTGAATGG AT

(2) INFORMATION FOR SEQ ID NO:14:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

ATGTGGGCTG GAATGACTGG AT

(2) INFORMATION FOR SEQ ID NO:15:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

ACCTGGGCTG GCAGGACTGG AT 22

(2) INFORMATION FOR SEQ ID NO:16:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 22 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

AGGACCTCGG CTGGAAGTGG AT 22

(2) INFORMATION FOR SEQ ID NO:17:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 22 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

GGGATCTAGG GTGGAAATGG AT 22

(2) INFORMATION FOR SEQ ID NO:18:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 22 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

AGGATCTGGG CTGGAAGTGG GT   22

(2) INFORMATION FOR SEQ ID NO:19:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

AGCTGGGCTG GGAACGGTGG AT   22

(2) INFORMATION FOR SEQ ID NO:20:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

ACATCGGCTG GAATGACTGG AT   22

(2) INFORMATION FOR SEQ ID NO:21:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 22 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

TCATCGGCTG GAACGACTGG AT   22

(2) INFORMATION FOR SEQ ID NO:22:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 29 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

ATGAATTCGA GCTGCGTSGG SRCACAGCA   29

(2) INFORMATION FOR SEQ ID NO:23:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 21 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

GAGTTCTGTC GGGACACAGC A   21

(2) INFORMATION FOR SEQ ID NO:24:

    (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 21 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

CATCTTTTCT GGTACACAGC A   21

(2) INFORMATION FOR SEQ ID NO:25:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 21 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

CAGTTCAGTG GGCACACAAC A   21

(2) INFORMATION FOR SEQ ID NO:26:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 21 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

GAGCTGCGTG GGCGCACAGC A   21

(2) INFORMATION FOR SEQ ID NO:27:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 21 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

CAGCGCCTGC GGCACGCAGC A   21

(2) INFORMATION FOR SEQ ID NO:28:

        (i) SEQUENCE CHARACTERISTICS:
            (A) LENGTH: 21 base pairs
            (B) TYPE: nucleic acid
            (C) STRANDEDNESS: single
            (D) TOPOLOGY: linear

        (ii) MOLECULE TYPE: DNA

        (xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

TAAATCTTGG GACACGCAGC A   21

(2) INFORMATION FOR SEQ ID NO:29:

        (i) SEQUENCE CHARACTERISTICS:
            (A) LENGTH: 21 base pairs
            (B) TYPE: nucleic acid
            (C) STRANDEDNESS: single
            (D) TOPOLOGY: linear

        (ii) MOLECULE TYPE: DNA

        (xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

CAGGTCCTGG GGCACGCAGC A   21

(2) INFORMATION FOR SEQ ID NO:30:

        (i) SEQUENCE CHARACTERISTICS:
            (A) LENGTH: 21 base pairs
            (B) TYPE: nucleic acid
            (C) STRANDEDNESS: single

(D) TOPOLOGY: linear.

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

CCCTGGGAGA GCAGCACAGC A   21

(2) INFORMATION FOR SEQ ID NO:31:

        (i) SEQUENCE CHARACTERISTICS:
            (A) LENGTH: 21 base pairs
            (B) TYPE: nucleic acid
            (C) STRANDEDNESS: single
            (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

CAGCTTGGTG GGCACACAGC A   21

(2) INFORMATION FOR SEQ ID NO:32:

        (i) SEQUENCE CHARACTERISTICS:
            (A) LENGTH: 21 base pairs
            (B) TYPE: nucleic acid
            (C) STRANDEDNESS: single
            (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

CAGCTTGGTG GGAATGCAGC A   21

(2) INFORMATION FOR SEQ ID NO:33:

(i) SEQUENCE CHARACTERISTICS:
             (A) LENGTH: 44 base pairs
             (B) TYPE: nucleic acid
             (C) STRANDEDNESS: single
             (D) TOPOLOGY: linear

      (ii) MOLECULE TYPE: DNA

      (xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

AGAATTCGCA TGCCATGGTC GACGAAGCTT TTTTTTTTTT TTTT   44

(2) INFORMATION FOR SEQ ID NO:34:

       (i) SEQUENCE CHARACTERISTICS:
             (A) LENGTH: 24 base pairs
             (B) TYPE: nucleic acid
             (C) STRANDEDNESS: single
             (D) TOPOLOGY: linear

      (ii) MOLECULE TYPE: DNA

      (xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

AGAATTCGCA TGCCATGGTC GACG   24

(2) INFORMATION FOR SEQ ID NO:35:

       (i) SEQUENCE CHARACTERISTICS:
             (A) LENGTH: 24 base pairs
             (B) TYPE: nucleic acid
             (C) STRANDEDNESS: single
             (D) TOPOLOGY: linear

      (ii) MOLECULE TYPE: DNA

      (xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

GGCTACGCCA TGAACTTCTG CATA   24

(2) INFORMATION FOR SEQ ID NO:36:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 24 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

ACATAGCAGG CATGCCTGGT ATTG   24

(2) INFORMATION FOR SEQ ID NO:37:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 23 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

CTGCAGCTGT GTTGGCCTTG AGA   23

(2) INFORMATION FOR SEQ ID NO:38:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 26 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

ACGAATTCCG ACGAGGCATC GACTGC

(2) INFORMATION FOR SEQ ID NO:39:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 26 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

GCGTCGACTA CCATGTCAGG TATGTC

(2) INFORMATION FOR SEQ ID NO:40:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 13 amino acids
        (B) TYPE: amino acid
        (C) STRANDEDNESS:
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: peptide

    (xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:
Met His His His His His His Lys Leu Glu Phe Ala Met
1   5   10

(2) INFORMATION FOR SEQ ID NO:41:

    (i) SEQUENCE CHARACTERISTICS:
        (A) LENGTH: 32 base pairs
        (B) TYPE: nucleic acid
        (C) STRANDEDNESS: single
        (D) TOPOLOGY: linear

    (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

GAATTCGCCA TGGGCATCGA CTGCCAAGGA GG

32

(2) INFORMATION FOR SEQ ID NO:42:

   (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 32 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

   (ii) MOLECULE TYPE: DNA

   (xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

CCGCTCGAGA AGCTTCAACT GCACCCACAG GC

32

(2) INFORMATION FOR SEQ ID NO:43:

   (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 26 amino acids
       (B) TYPE: amino acid
       (C) STRANDEDNESS:
       (D) TOPOLOGY: linear

   (ii) MOLECULE TYPE: peptide

   (xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

Pro Leu Ser Leu Leu Tyr Tyr Asp Arg Asp Ser Asn Ile Val Lys Thr
1   5   10   15

Asp Ile Pro Asp Met Val Val Glu Ala Cys
            20   25

(2) INFORMATION FOR SEQ ID NO:44:

   (i) SEQUENCE CHARACTERISTICS:
       (A) LENGTH: 39 base pairs
       (B) TYPE: nucleic acid
       (C) STRANDEDNESS: single
       (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

CCCGGATCCG CTAGCACCAT GACCTCCTCA TTGCTTCTG   39

(2) INFORMATION FOR SEQ ID NO:45:

        (i) SEQUENCE CHARACTERISTICS:
                (A) LENGTH: 21 base pairs
                (B) TYPE: nucleic acid
                (C) STRANDEDNESS: single
                (D) TOPOLOGY: linear

        (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

CCCTGTTGTC CTCTAGAAGT G   21

(2) INFORMATION FOR SEQ ID NO:46:

        (i) SEQUENCE CHARACTERISTICS:
                (A) LENGTH: 34 base pairs
                (B) TYPE: nucleic acid
                (C) STRANDEDNESS: single
                (D) TOPOLOGY: linear

        (ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

GGATCCGAAT TCGGCTTGGA GTGTGATGGCA AGG   34

(2) INFORMATION FOR SEQ ID NO:47:

        (i) SEQUENCE CHARACTERISTICS:
                (A) LENGTH: 34 base pairs
                (B) TYPE: nucleic acid
                (C) STRANDEDNESS: single

62

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          (D)  TOPOLOGY: linear

     (ii) MOLECULE TYPE: DNA



     (xi) SEQUENCE DESCRIPTION: SEQ ID NO:47:

GGATCCGAAT TCCTCTGGGA CCTGGCAACT CTAG                                34

(2) INFORMATION FOR SEQ ID NO:48:

          (i)  SEQUENCE CHARACTERISTICS:
               (A)  LENGTH: 22 base pairs
               (B)  TYPE: nucleic acid
               (C)  STRANDEDNESS: single
               (D)  TOPOLOGY: linear

          (ii) MOLECULE TYPE: DNA



     (xi) SEQUENCE DESCRIPTION: SEQ ID NO:48:

GAGAATTCCA RCARTTYTTY AT                                             22

(2) INFORMATION FOR SEQ ID NO:49:

          (i)  SEQUENCE CHARACTERISTICS:
               (A)  LENGTH: 21 base pairs
               (B)  TYPE: nucleic acid
               (C)  STRANDEDNESS: single
               (D)  TOPOLOGY: linear

          (ii) MOLECULE TYPE: DNA



     (xi) SEQUENCE DESCRIPTION: SEQ ID NO:49:

GCAAGCTTTR TAYTCRTCRT C                                              21
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